Users Guide for the GE amorphous Silicon "Angio" Flat Panel Detector

BTS group

Revision 2 (Last update 01/21/2008)

Content:

Sofware revision history:

Date	name	rev num	remark
1/21/2008	JL	10	Sponge only 2 threads in the Timer1 interrupt routine. One thread take care of the data taking request, which is a long blocking call, and the other one take care of the polling of the detector when the other thread is blocked.

User guide revision history:

Date	name	rev num	remark
6/27/2007	AM	1	Orginial Version
1/21/2008	JL	2	Order the topic into its present format. Added the single shot mode description.

Users Guide for the GE amorphous Silicon "Angio" Flat Panel Detector

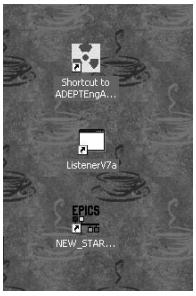
All critical programs have icons on the desktop in the upper right corner. Please do not move them.

User: dpadmin
Password:

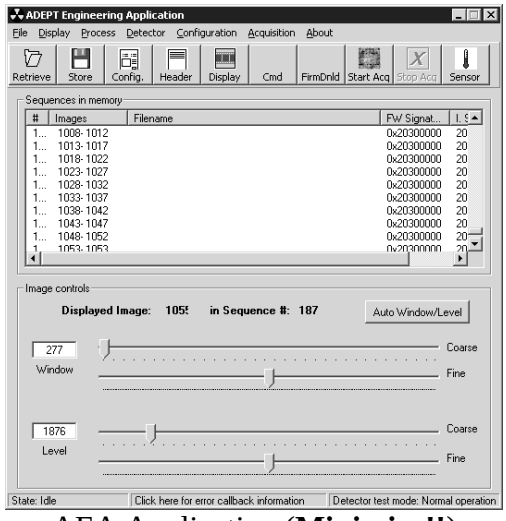
I) How to start the software.

There are currently 3 packages that you have to start to run the GE a-Si detector. They include

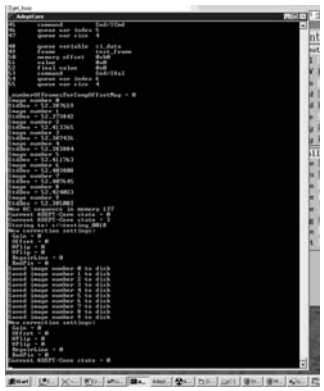
i.) AdeptCore Engineering Application ("AEA");
ii.) Listener (currently version = V10);
iii.) EPICS. The three icons are shown below.



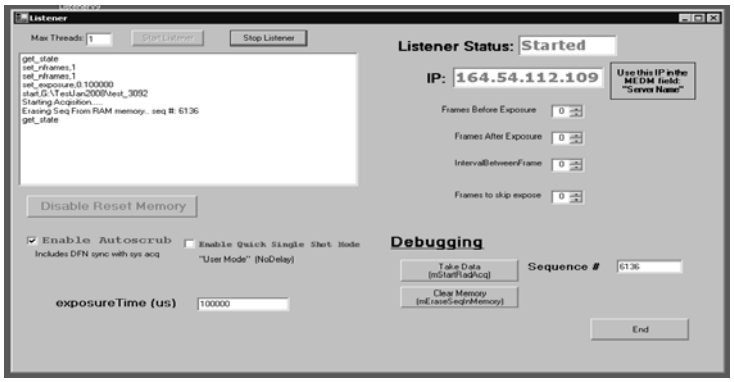
1.) First, you need start the **AEA**. It will start 2 windows: the AEA and also AdeptCore terminal window.
---- AdeptCore gives low- level information about what is going on. (The only thing you need to check in the AdeptCore terminal is if the "signature" is correct. For Rad mode (2k x 2k), the signature should be 0x02030000. See Appendix A). You normally do not need to use the AEA window, so you can just **minimize.** (***Don't close it.***)



AEA Application (**Minimize!!**)

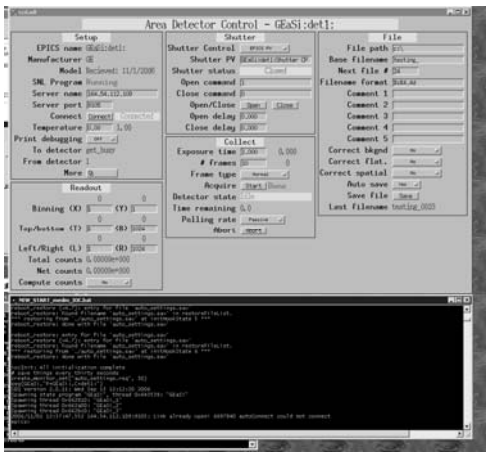

AdeptCore
(Low-level detector Info)

2.) Start **Listener**. (May take up to 2 minute to start!!!!) Make sure it is started!
---- This Window allows you to turn on and off the Autoscrub. We recommend that you leave it Enabled.
---- We also recommend that the Reset memory is Enabled. This deletes a sequence of images from RAM memory at the end of the sequence.
---- Under normal operation the "Enable Quick Single Shot Mode" checkbox should be left unchecked. See Appendix E for its usage. Please note that only one single frame per sequence will be taken if this box is checked.
---- The Listener functions as a link between EPICS and AdeptCore COM interface. You will see commands that are sent from EPICS to the detector/AdeptCore. (Note: The Listener will not start until the "Settling time" is zero!! This is at the bottom of the Config Window of the AEA)
---- It also allows you to change the number of before and after frames, but typically these are set to zero and the "during" or real data frames are set in the MEDM screen below.

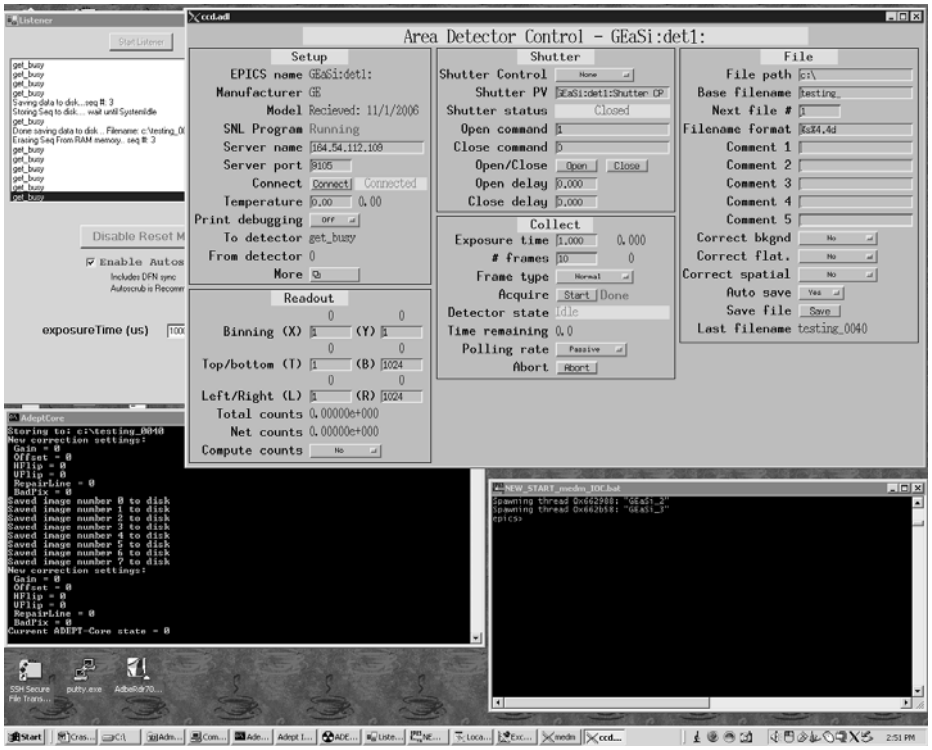


Listener (Make sure it is STARTED!!)

3.) Start **EPICS**. Make sure the Server Name matches the IP address from the listener. The EPICS shell terminal can be minimized but make sure you do NOT start more than one, if you have to re-start.

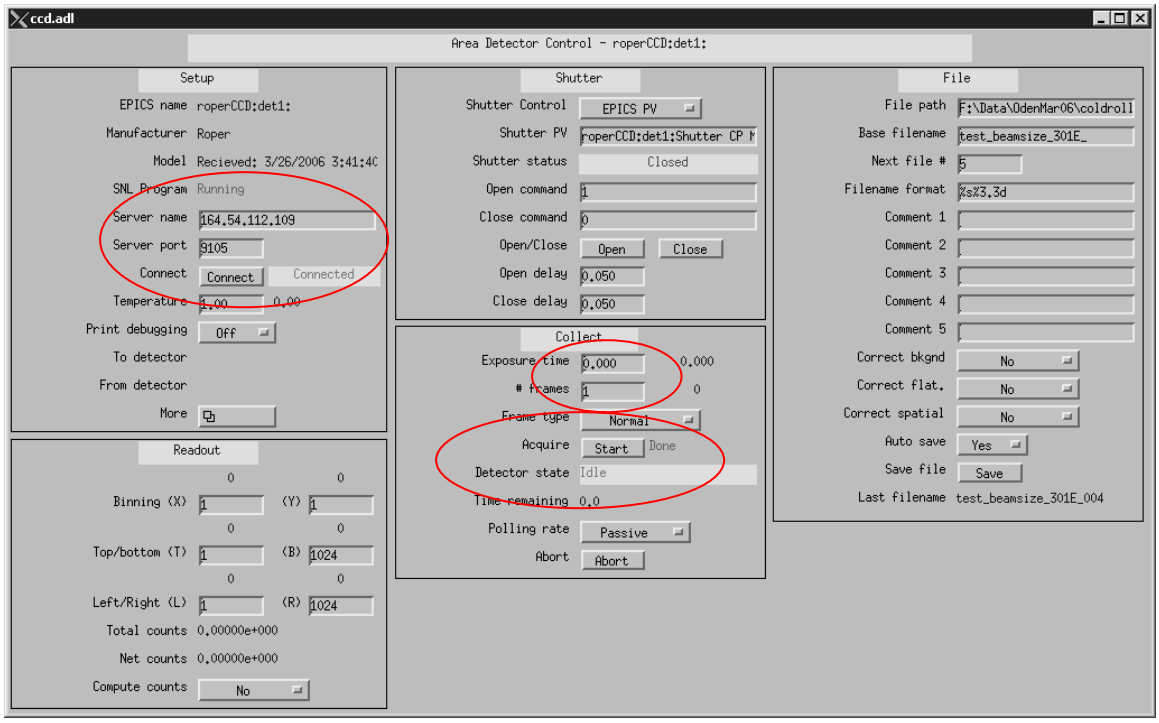


MEDM control window & epics terminal
(You can minimize the epics terminal).
Be careful to have one instance of EPICS running at one time!!!!!!



Recommended Desktop Layout

II) Control PVs.



MEDM ccd.adl control screen (from Mark Rivers)

Most commands are not implemented for GE detector (yet). Ones that work are circled.
The "Connect" button is used if the Listener or Adept program crash to reconnect. The first time that the Detector moves to the new subnet (i.e., a new sector), you need to change the Server name to match the IP address of the computer. The Listener will display this. You need to enter this IP address into the MEDM screen and click on the "Connect" button. The EPICS autosave application will save this value from here after.

1) **Exposure Time**: This is for each frame/image and is in units of SECONDS, here. [In GE's language, it's the "time between frames (TBF)".]

2) **# Frames**: The number of images you want in your sequence. Must be less than 300 or the system will crash!!!!!

3) **File Path**: Make sure that this path actually exists!!!!! It is recommended to keep this fixed during the run and only change the filename. Also, include a \ at the end of the path (e.g., **C:\Data**)

4) **DetectorState:**

/* The following must agree with the states in the CCDState PV */
#define DETECTOR_IDLE 0 "Idle"
#define DETECTOR_ACQUIRE 1 "Acquire"
NOTE: If you do a pv_get of DetectorState, you will get a string back (i.e., Idle or Acquire). I think there is a way to get an integer, but I don't know, yet.

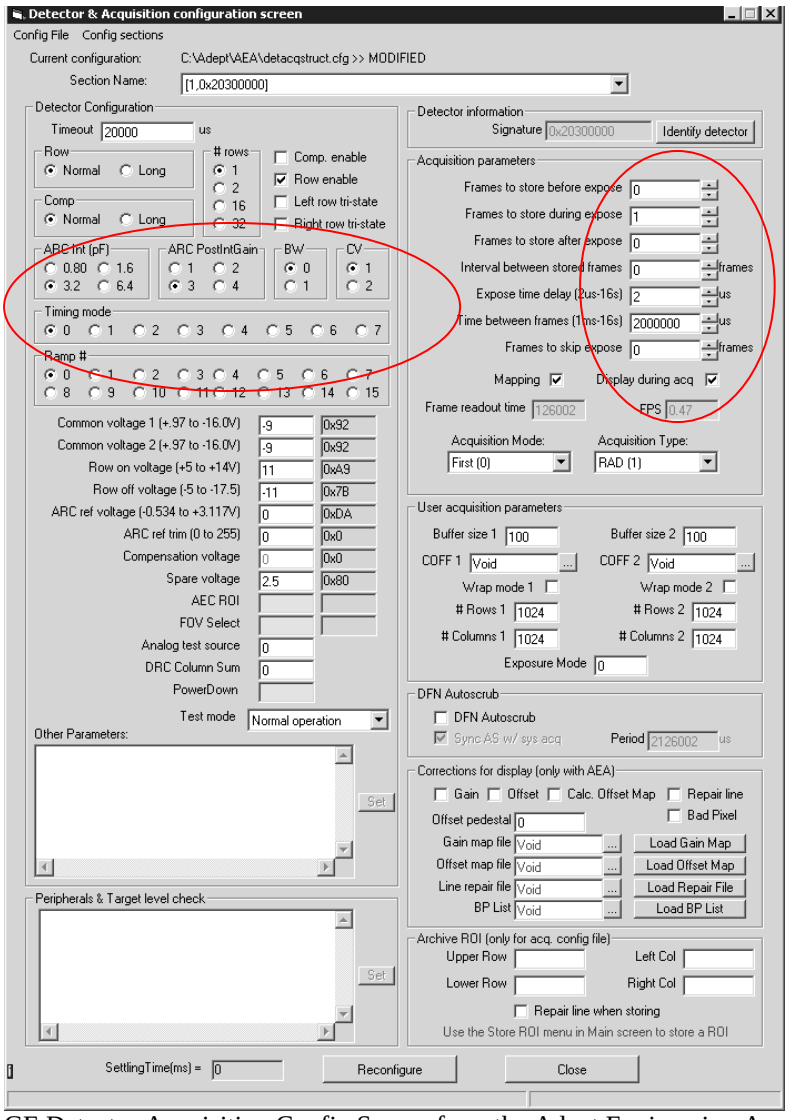
Notes: In "Rad" mode, detector is 2k x 2k (no binning) with a 125 ms readout (8 fps). This speed is for no acquisition time, so real usage can only be slower. "The Angio" is 1k x 1k (2 x 2 binned) 0.033 ms readout (30 fps), and a 1k x 1k image is also possible in a ROI mode. The instructions below are for "Rad" mode.

III) Known Problems:

1) Occasionally the real-time image display on the second monitor will disappear. You will see errors after each image/frame is read into the RAM memory buffer (e.g., "**_processthread1**". The data is still valid. To fix this, you will have to restart AdeptCore, and thus EPICS and the Listener. We have reported this problem to GE, but they are unsure of the cause.

2) From the EPICS interface…. the very first time that you try to acquire a sequence of images, the exposure time and number of images is NOT that which is specified in the EPICS screen. Rather it uses the parameters last in the Adept AEA Config window. But all other acqusisitons from EPICS seem to work and you can change the exposure time and number of images without a problem.

IV) Expert AdeptEngApp Config Window (do not use unless fully understand the consequences.)

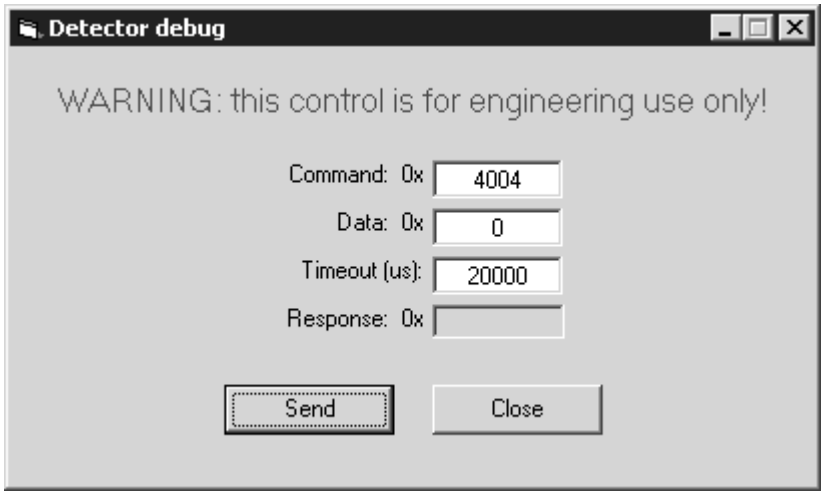


GE Detector Acquisition Config Screen from the Adept Engineering Application (Only for expert users!!)
Most fields should not be changed.
Fields to modify:

- Time between frames
- Gain (see gain table)
- Check if Signature is correct. If not, see Appendix A

Normally, leave “Frames to store before exposure” and “Frames to store after exposure” to be 0.
Time between frames is your exposure time.

Appendix A – Manual reload of active detector firmware.



If the signature is not correct: from the AdeptEngApp, press the “Cmd” button. Put “4004” in Command and “0” in Data to force the system to reload the firmware.

For Rad: From the Config. Button, select the [0x20300000] section from the pull down menu. The other signature are for Angio (Binning, 1k x 1k, 400 micron pixels), and Rad ROI (central portion, 1k x 1k @ pixel = 200 microns).

Appendix B – How to correct frames (i.e., dark , BPM, gain/flatfield correction)?

Ask your Beamline Scientist for the latest incarnation of this processing. These are typically located in: C:\Adept\Tools\Argonne\

Jscript (Microsoft) Correction:
Format: javascript.js imageframe darkframe #imageframes #darkframes

Scripts for PDF (from Karena Chapman/Peter Chupas/Peter Lee)
Typically, you create a MS-DOS batch file in the same directory as your images (e.g., process.bat), which contains commands like below (assuming 2k x 2k mode!)

```
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_A4_0009 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_A5_0010 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_B1_0011 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_B2_0012 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_B3_0013 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_B4_0014 dark_16s_50f 50 50
C:\Adept\Tools\Argonne\correctPDF_KWC.js Ge_B5_0015 dark_16s_50f 50 50
```

This will do a background subtraction, badpixel map, and gain-map/flatfield correction. (Note: that the gain map used is from a x-ray tube and contains the spatial structure (falling off at the edges) from the tube, thus is not really a flat-field.)

File Formats:
The corrected frames are stored in a file ending in **".cor",** except that the *8192 byte header is removed*, but the data format is the same as the raw data (2K x 2K, 16-bit unsigned integers). This script also creates an average **(.avg)** and a **.sum** files. The original 8192 byte header is also removed. The data format of the avg files are the same as the raw data (i.e., 2K x 2K, 16-bit unsigned integers (sizeof(unsigned short)). However, the sum files are 32-bit floats/real ((sizeof(float))).

Appendix C – How to use ImageJ

To read in raw GE files:

File → Import → Raw

Settings: 2048 x 2048
16-bit unsigned int
8192 offset (for GE header)
little-endian byte-order
# of Images (depends on how many in your sequence..)
Gap Between images = 0

Appendix D – Autoscrub Info (from German Vera @ GE)

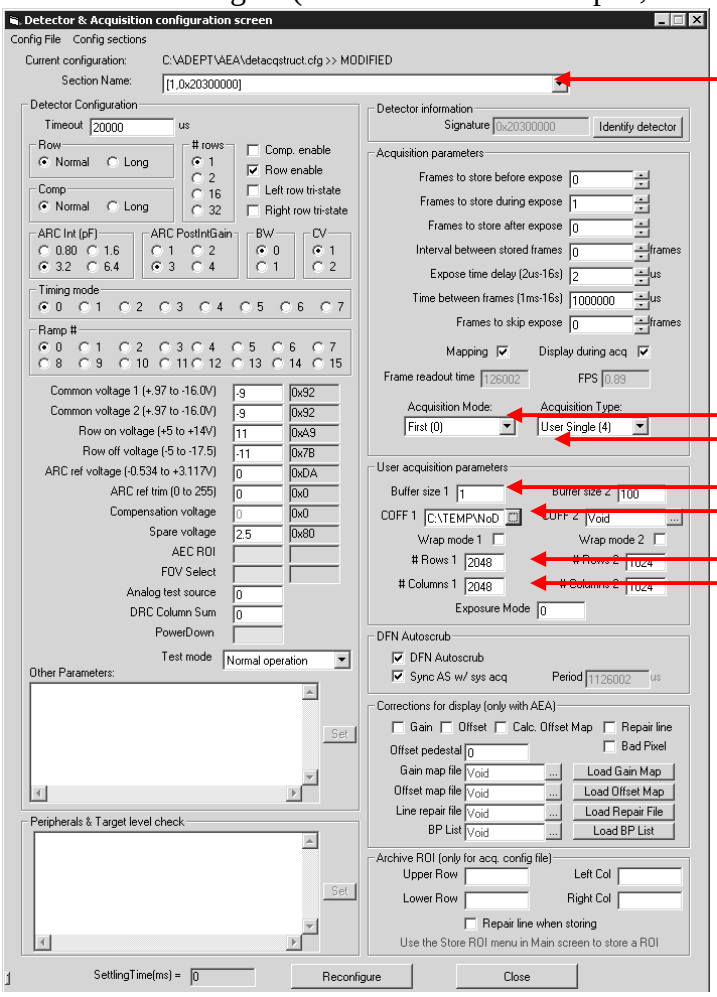
When DFN autoscrub is off, the DFN does not send scrub commands to the detector periodically. If the detector does not receive any scrub or image readout commands from the host for ~15 seconds, it will start autoscrubbing with a short time between scrubs (~5ms). When an acquisition is started, the detector may be running its internal autoscrub or may be just idle, so the time since the last scrub will be variable and will affect the dark frame portion of the images that are acquired. This means that offset subtraction using a previously acquired dark frame will not be complete, i.e. there will be some dark signal left. The amount of dark signal left can potentially change from acquisition to acquisition.

If you want to start an acquisition very quickly, a better solution would be to enable DFN autoscrub, but disable 'Sync A/S w/ sys acq'. In this case, you can specify the autoscrub period, as follows: Scrub Period = Timeout + Autoscrub Delay (labeled Delay in the DFN autoscrub section of the config screen). So, if you are running Rad mode (126ms readout time) and your timeout is 20ms, you could set the Autoscrub Delay to be 116ms, so you have 10ms between scrubs. Then, any acquisition will take from 0 to 136ms to start, plus one extra 126ms frame time. The benefit of doing this is that now your acquisition is repeatable because you are going from scrubbing with a period of 136ms to image acquisition always, and you can acquire a dark image in the same way, so that your offset correction actually gets rid of all the dark portion of the image.

Appendix E – Single shot mode

Single Shot mode allows for one image to taken with very little over head.
BEWARE: In this mode only ONE image taken at a time!!!!!

In the Detector & Acquisition configuration screen some parameters must be checked and changed. (Leave both windows open, but minimize)

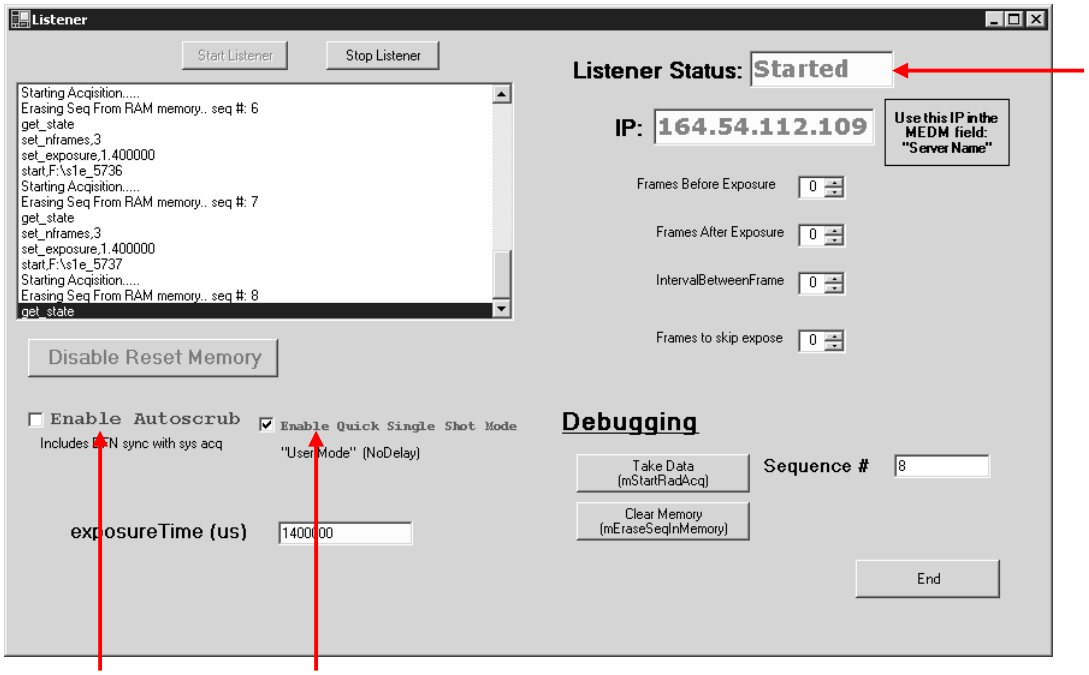


1,0x2030000

Ac.mode: First (0)
Ac.type: UserSingle(4)
BufferSize: 1
COFF 1: * (see below)
Row 1: 2048
Column 1: 2048

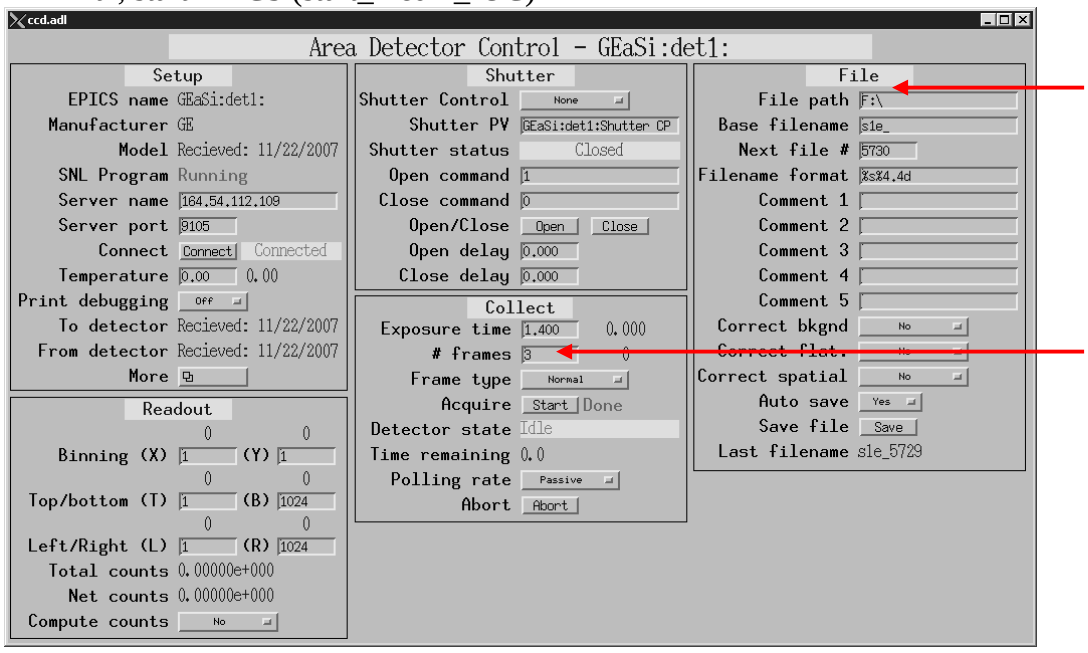
* C:\TEMP\ NoDelayDFNScript.bin

- Start up Listener (This may take some time, as the AEA needs some setting time and counts down.) Be patient and make sure Listener has started. Two things must
be



Disable Autoscrub, Enable Quick Single Shot Mode

- Final, start EPICS (start_medm_IOC)



File path: F:\

The line [# frames: 3] is correct, but single frames are collected anyway.